On-Premise Signage and Placemaking: Aiding Lively Streetscapes to Maintain Signage Visibility

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Abstract

Placemaking is an initiative with roots in the 1960s and 70s to enhance public life in the urban setting. This complex notion requires multiple disciplines, flexibility, and a human-centric approach toward development. While developing new streets and enhancing the existing, built environment, professionals, community residents, and business owners must consider multiple elements to bring people to the street: furniture, vegetation, walkability, art, and culture. With this sidewalk interaction comes the opportunity for economic development. When the people are drawn in, signage can inform the pedestrian. This study builds a collection of 200 photos, representing four levels of placemaking intensities. Each photo is coded into 600 cells to count the quantity of placemaking elements. Visual attentive software (VAS) is then used to measure the sign effectiveness to visually stand out. Placemaking initially impacts preattentive visibility, while the building façade, road surface, tree canopy, landscaping, and the sky each play a role. Planners, designers, and business owners can use these findings to better inform the impact and interaction of streetscape and business.

Keywords:

placemaking, visibility, design, on-premise signage

INTRODUCTION

Placemaking

The Project for Public Spaces (PPS; 2022) coined *placemaking* in the 1990s and acknowledges it is not a process they invented. Since the first cities in our archaeological record, humans have sought ways to attract and retain people with a system of diverse business owners and trades, shared language, organized bureaucracy, and the arts (Childe, 1950). Globally, urban movements sought social and economic improvement through Victorian-era reforms to improve housing and schools (Crook, 2019), the City Beautiful movement in North America to promote aesthetic redevelopments (Hess, 2006), and the modernist, New Town movement for planned communities like Letchworth, England or Brasilia, Brazil in the 1950s (Holston, 1989; Merlin, 1980). Other reforms include Urban Renewal—the intentional tearing down of low-income housing—building new housing for rapidly growing populations, and the construction of the urban freeway (Thomas and Dillard, 1997). These movements designed cities from the top down. These methods can be without identity; without the human element, they are placeless (Relph, 1976).

Placemaking differentiates from these past concepts by placing individuals at the local level as the purpose for changes in the built environment (PPS, 2022). The people's needs vary from clean air and water, social and economic opportunities, and the simple enjoyment of leisure in the area. The grassroots level is more in tune with its own needs and culture than a top-down, single-voiced authority (Alexander et al., 1977; Jacobs 1961). Fundamental authors such as Lynch and his web of nodes and paths (Lynch, 1960) and Alexander's (2015) multiple points of interest depict an integrated system of urban activity and life. The people

may unite for social bonding at any intersection within this web and support local businesses along the pathways. The people, seeking to improve their neighborhood, may positively impact the city community across geographic and temporal scales (Cabannes et al., 2018).

A breadth of built environment professionals, business owners, residents, and community leaders use placemaking to foster community quality. The broad scope of voices is necessary in the process because the aim is to cast a wide net to attract and retain people in the community to live, work, play, and learn (Wyckoff, 2014). Wyckoff identified three methods, in addition to what he designated as standard placemaking, that a community may identify for their process: (a) strategic placemaking focusing on a specific goal, (b) creative placemaking to highlight the arts and culture, and (c) placemaking as short and long-term built projects often for testing, learning, and improving. Forsyth (2015) suggested a simplification of placemaking's variety into three clusters of purposes to implement placemaking: means (Do the planners intend to develop a goal, such as walkability?); outcomes (Is this to improve public life?); or multidimensional (Are planners seeking to develop vitality?). No matter the varied methods or goals for placemaking, a street has the opportunity to host placemaking elements as a streetscape.

Streetscapes and Placemaking Elements

Placemaking requires such a breadth of professionals and strategies because it varies from large-scale complexity to detail-oriented solutions (Cabannes et al., 2018). Community empowerment and development may include the use of art, economics, connectivity, and housing policy (PPS, 2022). The street is one element of the urban fabric providing a space for the intersection of these elements. An engaging sidewalk near the street makes for places that attract people (Jacobs, 1961). As exciting and engaging downtowns attract more people, so too the streets will grow in ever-increasing design and visual complexity. Gibson and Shaw (1977) first created the affordance theory, in that the physical elements of the surroundings can impact behaviors. This may include an affordance of a feeling of danger, encouraging people to avoid an area or a beautiful setting, encouraging people to access and utilize a streetscape.

A photo analysis of streetscapes acknowledges the many components of a streetscape, including the building façade, sky, road, sidewalk, and vegetation (Chen et al., 2022). The building itself is one important component of a streetscape, providing an edge between internal and external spaces, a location of safety for businesses and residents, and a means to frame views. Though the sky is static in a photograph, it remains an opportunity for light to permeate the streetscape for a possible increase in visibility, while moving shadows highlight different components of the street. The quantity of sidewalk space provides more room for quality site amenities and pedestrians, developing greater opportunities for placemaking to occur. Such placemaking elements include concentrations of *art*, *vegetation*, *people*, and *furniture*.

One placemaking method is the development of new art in the urban environment, ranging from ad hoc graffiti, temporary performance art or ad hoc citizen built decorations, and commissioned murals and statues (Billings et al., 2022). As art is viewed differently by each viewer, so too different forms of art have different impacts on the community (Frederick & Clarke, 2014). Commissioned, public art can build a sense of community ownership of the streetscape, reducing the potential for crime and vandalism. This is due to art's ability to activate underutilized areas, building new and desirable pathways to established areas of activity (Matthews & Gadaloff, 2022) and connecting primary pathways to each other in the urban fabric (Billings et al., 2022). While the positive effects of art on the streetscape may dissipate (Zebracki et al., 2010) a lighter-quicker-cheaper mentality (PPS, 2022) suggests these spaces can be reactivated with art repeatedly over time.

From the Hanging Gardens of Babylon to Singapore's Tree Towers in the Gardens by the Bay, humans can enjoy vegetated spaces in the urban environment. Much of modernist, urban tree research considers this respect for nature in studying the preservation, the ecological effects, and the changes to the microclimate (Li, 1969; Simon et al., 2018; Smith, 1977). Nature is entwined with humanity and thus plays a key role in placemaking (Cilliers et al., 2015). "Green placemaking" has developed as a recent strategy to reactivate street life and placemaking (Gulsrud et al., 2018). Similar to art, residents believe it is the government's responsibility to provide and care for street trees (Moskell

& Allred, 2018). Nevertheless, street trees can provide a calming, safe environment, promote social ties (Kuo et al., 1998), and support a microclimate for pedestrians to enjoy a space (Y. Wang & Akbari, 2016).

Gathered people are core to placemaking because more people will gather when a comfortable group is established (Whyte, 1980). People attract more people and self-manage the crowds to a comfortable capacity. People stay in functional and beautiful places (Wey & Wei, 2016). A concentration of people may provide a greater economic opportunity for business and could require more complex streetscapes. To pause in a space and view opportunities of social and economic participation in the streetscape, pedestrians require furniture. Customizable furniture unique to each streetscape provides opportunities for shade, social interaction (van Ameijde et al., 2022), and technology to recharge or digitally interact with the streetscape (Chew et al., 2021). Well-designed lighting plans highlight key elements in the streetscape, provide safety, and allow gatherings into the evenings, particularly in areas of shorter daylight.

Placemaking and Signage

Signage has long played a key role in placemaking. Ancient Romans crafted signboards with modest materials such as wood, stone, and terracotta to promote commercial and social activities for businesses and on public ground (Beard, 2017). Europe's rapid trade expeditions in the 11th and 12th centuries supplied a rich ground for more sophisticated on-promise signage for wealthy merchants and renowned craftsmen (Mircea, 2019). As Europe's commerce continuously expanded, so did the sign industry and signage's appearance in the everyday. It was emblematic that Charles II ordered no outdoor sign to hang across streets or pedestrian walkways due to public safety concerns relating to the fall of signs (Mircea, 2019). Signage quickly became more than just mere promotional tools for commerce but also a subject of legal consideration and city planning elements which entered deep into the consciousness of early urbanites' lives.

A series of important human inventions shape the function, design, and even the meaning of on-premise signage. Remarkable manmade inventions such as the gas light (1840), the incandescent light bulb (1880), neon (1910), and plastic (1907) have followed a lineage through the Industrial Revolution to today for evolving signage opportunities in the streetscape. In the North American context, the popularity and dominance of the automobile affected the design of signages, as "street signs should be designed for maximum legibility in the conditions under which they are most frequently seen—in this country, from a moving car" (Ewald, 1971, p. 6). Automobiles not only affected the formal quality of signage but its social function beyond immediate advertising media. Signs function like cement that holds American society together in the midst of a vast continent connected with highway systems (Jackle & Sculle, 2004).

In addition to its technological and functional adaptations, signage in urban streetscapes needs to be understood as an integral part of a larger urban communication system. Jackle and Sculle (2004) recognized signage as more than mere technological and utilitarian terms but as fundamental instruments that impact the social behavior of people. "Signs, as they implicate in human symbolic interaction, are fundamental instruments of social construction" (Jackle & Sculle, 2004, p. 167). The broader social aspects of signs and their role in shaping the culture of neighborhoods were discussed recently through the lens of sociolinguistics and anthropology (Trinch & Snajdr, 2020). *What the Signs Say* details the relationship between Brooklyn, NY retail signs' linguistic elements and gentrification. Here, the authors recognized the cultural significance of storefront signs beyond their intended functions and expectations, affirming their role as an important register of placemaking (Trinch & Snajdr, 2020). In their design project of capturing unique visual characteristics of neighborhoods in Cincinnati, Ohio, Mehta and Rahman (2017) demonstrated how urban typography, including retail signages of local businesses, has contributed to the identity of the neighborhood. These two studies explain with vivid examples how on-premise signage is thoroughly involved in the varying aspects of placemaking.

Summary

Many have experienced placelessness. It varies by the individual. For some, it is walking into Times Square and being surrounded by such visual diversity that it becomes a blur instead of unique. For others, it is the view from a

highway exit ramp with simplistic signs on tall, widely-spaced posts, each competing with the next for visual dominance. Placemaking seeks to balance this dichotomy of abundance and emptiness by remaining flexible for day-to-day activities, adaptable to different audiences and over time inviting authentic experiences (Ellin, 2006).

Placemaking and signage are linked through urban planners' and designers' work in form-based code (Crawford et al., 2015); pedestrians look for just the right business for shopping and visitors or new residents use wayfinding for the right landmark or node to begin their adventure. Signage has the potential to inform the community through writing of the historical and cultural importance of an area, while placemaking can help the people feel the excitement and local culture. While trees may provide placemaking opportunities, many business owners have long felt hesitant to a full streetscape development, as it may detract from or block their storefront or their on-premise signage (Dumpelmann, 2019; Wolf, 2004). How may planners and designers establish the heart of placemaking in the streetscape, while maintaining universal, visual access to on-premise signage? What aspects of placemaking may damage signage visibility? Using 3M's VAS software and a variety of placemaking images, this study explores each placemaking element's impact on sign visibility.

METHODS

A Definition of This Study's Terms

placemaking elements: visible parts of the streetscape, including the street furniture, trees, and on-premise signage. These elements are found in the placemaking library (see below).

placemaking intensity: a ranked set of images with increasing levels of placemaking from original images without placemaking (26 images) to increasingly more complex images at levels 1, 2, and 3. Level 1 features images from the placemaking library while level 3 features more images from the library.

placemaking library: a collection of digital, placemaking elements placed on top of the original street image

VAS output: a variable using the VAS software that predicts preattentive visibility of the primary sign

Image Development

The research team created a catalog of 26 original photographs of a midsize, Midwestern American downtown street. Photographs are a common method to study a streetscape (Chen et al., 2022; M. Wang et al., 2015). A Midwestern, American downtown allows for a broad sample with building densities and populations related to many other communities. These photographs show few placemaking elements, as they are streets rather than streetscapes. They include the primary building and its signage and often lack art, vegetation, furniture, and are without people. This was intentional to help develop three additional levels of placemaking intensity within the photographs. The team also built a placemaking library of streetscape

elements, including furniture (metal and wooden benches, lighting from posts to bollards and sconces), art (murals, sculptures, seasonal decor), vegetation (trees, ground-level shrubs, lawn/turf). Each element was its own layer in Photoshop, allowing for each one to be moved on its own.

Each of the 26 original images was opened in Photoshop where the study's method integrated placemaking elements from the placemaking library. As an example, a researcher could pull a streetlamp from the library and put it directly on top of the original image in the appropriate location and scale on the street (see Figure 1). Using Photoshop, the team created three levels of placemaking intensity on top of the original, continually adding more placemaking elements from the placemaking library. These additions provide a placemaking intensity of levels 1, 2, and 3. In this manner, the team assembled 200 images for examination. Some of the original photographs were used as a base to build upon multiple times.

Coding

Using methods from M. Wang et al. (2015), the team placed a 5" x 7" grid over the 5" x 7" images, with each cell in the grid measuring ¼" x ¼". This created 600 cells for each of the 200 images. The researchers color coded each cell to a streetscape element (see Figure 1). A cell filled with at least 51% of a placemaking element was coded to that one element. The cell colors were used solely to aid in counting the individual cells. From this, the researchers gathered a count of cells for each streetscape element. The researchers met after working independently on the first four images (an original, and its intensity levels 1–3) to ensure reliability. We selected fifteen elements to represent the future coded work:

- Primary business sign of the photograph (coded: red)
- Secondary signage (wayfinding, street signs about sales in the store; pink)
- Building façade, including windows on the second story and above (brown)
- First-floor transparency (windows, often display windows for store; light blue)
- People (yellow)
- Furniture (benches, lights, street tables and umbrellas, awnings, fountains; purple)
- Art (murals, sculptures, seasonal décor; magenta)
- Tree canopy (all areas above the tree trunk; dark green)
- Other landscaping (thin tree trunk, window boxes, visible green roofs; green)
- Turf (usually grass in a right of way; light green)
- Sidewalk surface (light gray)
- Road surface (dark gray)
- Cars (any motorized, street vehicle; beige)
- Sky (blue)
- Other (fire hydrant, utility box; black)

An example of this coding process can be found in Figure 1. As placemaking elements from the placemaking library become more abundant in the image (Placemaking intensity increasing) image color (or coding) becomes more diverse. In Figure 1, the red coding represents the business's primary signage, purple represents the awning (furniture), pink represents the secondary signage found in the windows, blue represents the large windows, decorative planter box benches coded to furniture (purple), and the sidewalk and road coded light and dark gray respectively. Yellow cells represent people, which first appear in intensity

Figure 1 /

The Original Image and Its Streetscape Element Coding (Top Row), With Increasing Streetscape Intensities and Their Coded Cells for Level 1, Level 2, and Level 3

level 1. The trees placed in intensity level 2 have trees coded to dark green across the top of the images, breaking up some of the awning (purple). Art appears in the windows on level 3 and is coded to magenta. Note that coded images, in a raster format, do not perfectly depict all the contents of an image. For example, the small plants in the planter boxes (original photograph) represented the smallest portion of these cells, which were coded to first floor transparency and furniture; the planter boxes do not appear in coding.

Visual Attentive Processing (VAS) and Statistical Analysis

3M's visual attention software (VAS; 3M-VAS, 2022) tracks what the eye is likely to see before cognitive function begins. This precognitive phase is referred to as preattentive processing and refers to the first 3–5 seconds while viewing a scene. This software employs brain and eye science to remove the influences of "gender, age, and culture" (3M-VAS, 2022) that could affect visual attention. VAS assesses a photograph by combining the number of edges within the image, the photograph's intensity, red-green contrast, blue-yellow contrast, and faces. Each of these elements are the "building blocks" that can attract the eye before cognition begins.

We analyzed the 200 streetscape images with VAS to understand the percent likelihood of discovering the on-premise signage in a precognition phase. As shown in this VAS-produced image (Figure 2), the likelihood of success, according to the software, of on-premise signage visibility for the original image was 79%. The likelihood of a person seeing the planter boxes in yellow and purple is 98%, while a person has a 73% of seeing the sky and tree above the awning

Figure 2 /

Visual Attentive Processing Results for the Original Image in Figure 1

in preattentive processing. This 79% chance of seeing the sign in preattentive processing creates an additional variable for data analysis, later referred to as the VAS output.

In this study, we used SPSS to test changes and influences of three sets of variables: placemaking intensity (original, levels 1–3), placemaking elements (primary sign, secondary sign, furniture), and VAS output (the percent likelihood of finding a sign in preattentive processing). The team first compared through ANOVA the placemaking intensities (independent) and their statistical influence on the VAS Output (dependent). We used a Tukey post hoc test to compare individual levels of placemaking intensity within the dependent variable (compare the original to level 1, compare level 2 to level 3, etc.).

To understand if placemaking elements could impact VAS output, we performed linear regressions at each level of placemaking intensity. We identified the placemaking elements as the independent variables while the VAS output served as the dependent variable. Does the quantity of cells coded to "people" significantly alter the VAS output in the original image, level 1, level 2, and level 3? After understanding which variables have a significant influence over the VAS output, we placed such variables into a multilinear regression to measure if these can be stronger predictors when analyzed together.

RESULTS

Overall Analysis—All 200 Images Studied

The 200 images are comprised of 26 original photographs, and 58 Photoshop-built images at levels 1–3 placemaking intensity. The mean VAS output decreases from 70.23% in the original images to 56.28% at level 3 intensity. With 0.05 P value as the determinant for statistical significance in this study, the VAS output significantly decreases once placemaking was established at a level 1

intensity streetscape (59.93% mean VAS output). We found no other significant changes in the VAS output once placemaking elements populated the streetscape images (see Tables 1–2).

Table 1 / VAS Output and Sample Size by Placemaking Intensity Levels

Placemaking intensity	Mean VAS output	*N*	Std. dev.
Original	70.23%	26	15.09
Level 1	59.93%	58	13.67
Level 2	57.72%	58	13.86
Level 3	56.28%	58	13.61
Total	59.57%	200	14.47

Table 2 / ANOVA and Tukey Results (Overall ANOVA Model Results $P = .001$, $F = 6.538$, Asterisk denotes significant differences found in all ANOVA tables)

Comparison level	Significance	Std. error
Original–Level 1*	0.010	3.281
Original–Level 2*	0.001	3.281
Original–Level 3*	0.000	3.281
Level 1–Level 2	0.828	2.581
Level 1–Level 3	0.491	2.581
Level 2–Level 3	0.943	2.581

As individual variables, the cell count coverage for building façade, tree canopy, landscaping, road surface, and sky are significant predictors of a 0.05 value for VAS output (see Table 3) when examined with an ANOVA. Positive B values indicate a symbiotic relationship to preattentive processing, while the negative values for trees, landscaping, and sky indicate they significantly decrease the VAS output. The three most commonly coded cells for placemaking elements across the photographs are the building façade, road surface, and tree canopy, while secondary signs, art, and turf are more infrequent (see the mean cell count in Table 3).

Table 3 / Placemaking Element Results for 200 Images,
*Significant Influence on VAS Output

Placemaking element	Mean cell count	Std. dev.	Linear regression results compared to VAS output			
			Constant	B	R-square	Sig.
Primary sign	25.415	37.054	59.424	0.006	0.000	0.836
Secondary sign	8.835	11.210	58.304	0.143	0.012	0.118
Building façade*	106.010	59.701	53.016	0.062	0.065	0.000
Transparency	25.870	20.727	57.757	0.070	0.010	0.157
People	24.575	20.612	61.665	−0.085	0.015	0.087
Furniture	45.175	38.727	58.569	0.022	0.004	0.404
Art	4.140	12.596	59.902	−0.080	0.005	0.325
Tree canopy*	90.415	53.533	63.141	−0.040	0.021	0.039
Landscaping*	36.600	25.923	63.388	−0.104	0.021	0.008

Placemaking element	Mean cell count	Std. dev.	Linear regression results compared to VAS output			
			Constant	B	R-square	Sig.
Turf	9.230	16.987	59.849	−0.030	0.001	0.618
Sidewalk surface	43.135	33.108	60.531	−0.022	0.003	0.474
Road surface*	92.245	64.745	55.805	0.041	0.033	0.010
Car	27.260	26.405	60.297	−0.027	0.002	0.494
Sky*	60.565	45.632	65.190	−0.093	0.086	0.000
Other	0.550	2.587	59.826	−0.465	0.007	0.241

A multilinear regression of only these significant placemaking elements yields a significant model of 0.000. The R-square for the regression model (0.189) more than doubles the highest previous R-square, indicating a greater quantity of the variance explained. Not all individual placemaking elements yield a significant influence over the VAS output in this model.

Table 4 / Multilinear Regression Results for 200 Images

Placemaking element	B	Beta	t	Significance
Constant	57.178		9.950	0.000
Building façade	0.042	0.172	1.857	0.065
Tree canopy	−0.036	−0.133	−1.586	0.114
Landscaping	0.023	0.041	0.528	0.598
Road surface	0.063	0.280	3.757	0.000
Sky	−0.089	−0.282	−3.633	0.000

Original Photographs

For the 26 original photographs, no placemaking elements held a significant influence on the VAS output. Those trending toward an influence are first-floor window transparency, people, and the sky (see Table 5). The building façade, road surface, and sky are most prominent in the cell count.

Table 5 / Placemaking Element Results for Original Photographs, Including Cell Count for Each and Significant Influence on VAS Output

Placemaking element	Mean cell count	*N*	Std. dev.	Linear regression results compared to VAS output			
				Constant	B	R-square	Significance
Primary sign	23.192	26	39.829	69.080	0.050	0.017	0.524
Secondary sign	7.923	26	9.090	72.530	−0.290	0.031	0.393
Building façade	133.769	26	77.681	62.069	0.061	0.099	0.118
Transparency	27.038	26	21.523	63.276	0.257	0.135	0.065
People	2.038	26	4.476	72.580	−1.152	0.117	0.087
Furniture	48.385	26	38.680	70.192	0.001	0.000	0.992
Art	0.769	26	1.986	71.554	−1.720	0.051	0.266
Tree canopy	58.846	26	48.723	74.175	−0.067	0.047	0.288
Landscaping	18.731	26	19.548	73.461	−0.172	0.050	0.273
Turf	15.923	26	24.625	71.603	−0.086	0.020	0.493
Sidewalk surface	51.808	26	37.966	72.666	−0.047	0.014	0.565

Placemaking element	Mean cell count	*N*	Std. dev.	Linear regression results compared to VAS output			
				Constant	B	R-square	Significance
Road surface	105.731	26	62.931	67.272	0.028	0.014	0.570
Car	26.808	26	24.562	70.209	0.001	0.000	0.995
Sky	78.615	26	53.066	77.960	−0.098	0.120	0.084
Other	0.423	26	1.501	70.753	−1.234	0.015	0.550

Level 1 Placemaking Intensity

Level 1 intensity is the first and only stage during which preattentive processing (VAS output) significantly decreases. The sky is the only placemaking element with a significant detraction when analyzed on its own (see Table 6). The building façade's mean cell count decreases, while a tree placed on the sidewalk develops a larger cell count for tree canopy. The count for people, while a smaller proportion of the whole, greatly increases compared to the original 26 images.

Table 6 / Placemaking Element Results for Level 1 Intensity Images, Including Cell Count for Each and Significant Influence on VAS Output

Placemaking element	Mean	*N*	Std. dev.	Linear regression results compared to VAS output			
				Constant	B	R-square	Significance
Primary sign	26.121	58	37.719	59.514	0.016	0.002	0.743
Secondary sign	9.638	58	11.400	59.424	0.053	0.002	0.744
Building façade	117.621	58	56.111	54.992	0.042	0.030	0.196
Transparency	28.483	58	21.136	59.223	0.025	0.001	0.775
People	24.241	58	16.687	58.618	0.054	0.004	0.622
Furniture	46.034	58	47.419	58.262	0.036	0.016	0.347
Art	0.948	58	3.322	59.906	0.027	0.000	0.961
Tree canopy	83.466	58	57.986	59.140	0.009	0.002	0.765
Landscaping	29.172	58	22.700	62.082	−0.074	0.015	0.360
Turf	10.017	58	17.533	61.260	−0.133	0.029	0.202
Sidewalk surface	45.121	58	32.490	60.096	−0.004	0.000	0.948
Road surface	91.914	58	64.573	57.052	0.031	0.022	0.268
Car	25.414	58	26.945	61.635	−0.067	0.017	0.323
Sky*	61.379	58	43.894	69.483	−0.156	0.250	0.000
Other	0.431	58	1.535	60.128	−0.457	0.003	0.702

Level 2 Placemaking

The sky continues to be the only element to significantly affect (and detract) the VAS output. Like the overall analysis of the 200 hundred images, the building façade and the road surface continue to trend toward a positive influence on preattentive processing (see Table 7).

Table 7 / Placemaking Element Results for Level 2 Intensity Images

Placemaking element	Mean	*N*	Std. dev.	Linear regression results compared to VAS output			
				Constant	B	R-square	Significance
Primary sign	24.414	58	35.642	57.524	0.008	0.000	0.875
Secondary sign	8.638	58	11.886	56.164	0.181	0.024	0.246
Building façade	103.690	58	57.656	52.116	0.054	0.051	0.090
Transparency	26.293	58	21.466	54.772	0.112	0.030	0.192
People	27.690	58	19.187	57.894	−0.006	0.000	0.949
Furniture	44.276	58	33.633	57.152	0.013	0.001	0.815
Art	3.034	58	9.138	57.390	0.110	0.005	0.588
Tree canopy	93.966	58	51.614	61.906	−0.045	0.027	0.214
Landscaping	39.655	58	26.345	62.059	−0.109	0.043	0.118
Turf	8.603	58	15.671	58.257	−0.062	0.005	0.601
Sidewalk surface	43.052	58	33.854	60.322	−0.060	0.022	0.270
Road surface	88.000	58	65.194	53.187	0.052	0.059	0.067
Car	28.638	58	27.294	57.249	0.017	0.001	0.808
Sky*	59.414	58	44.532	64.626	−0.116	0.139	0.004
Other	0.707	58	3.524	58.296	−0.809	0.042	0.121

Level 3 Placemaking

The sky cell count continues its trend to influence the VAS output; however, secondary signage is found to be the only statistically significant and positive relationship to the VAS output. This level has a higher count for tree canopy and road surface than building façade.

Table 8 / Placemaking Element Results for Level 3 Intensity Images, Including Cell Count for Each and Significant Influence on VAS Output

Placemaking element	Mean	*N*	Std. dev.	Linear regression results compared to VAS output			
				Constant	B	R-square	Significance
Primary sign	26.707	58	37.404	56.792	−0.019	0.003	0.692
Secondary sign*	8.638	58	11.406	53.345	0.339	0.081	0.031
Building façade	84.276	58	48.469	53.428	0.034	0.014	0.368
Transparency	22.310	58	19.195	57.956	−0.075	0.011	0.428
People	31.897	58	23.058	55.618	0.021	0.001	0.795
Furniture	43.776	58	34.523	56.386	−0.003	0.000	0.962
Art	9.948	58	20.162	56.668	−0.039	0.003	0.663
Tree canopy	107.966	58	45.908	0.000	−0.008	0.001	0.838
Landscaping	48.983	58	24.532	53.435	0.058	0.011	0.435
Turf	6.069	58	12.522	56.127	0.025	0.001	0.866
Sidewalk surface	37.345	58	30.340	58.100	−0.049	0.012	0.416
Road surface	90.776	58	66.139	53.775	0.028	0.018	0.317
Car	27.931	58	26.319	57.125	−0.030	0.003	0.661
Sky	52.810	58	43.737	60.120	−0.073	0.055	0.077
Other	0.569	58	2.747	56.088	0.330	0.004	0.620

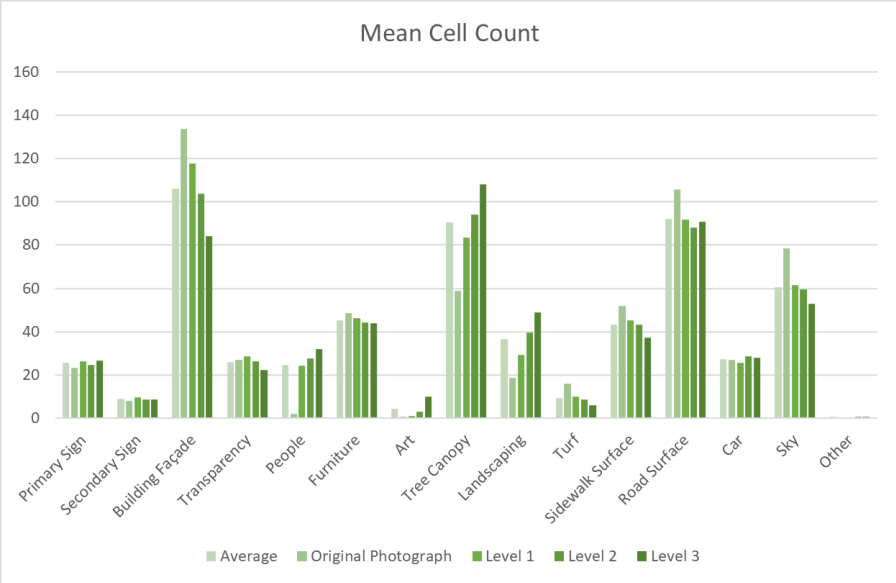

Figure 3 /

Mean Cell Count for Each Placemaking Element at Each Intensity Level

DISCUSSION

Impact of Image Development

While building the placemaking intensity image library, the study approach avoided blocking the primary signage, as its visibility would be core to this study. For pedestrians in a real setting, the viewpoint is always changing—from across the street, to taking a few steps forward, or depending on if a tree is holding its leaves. The pedestrians also have a variety of heights and viewpoints. These original photographs were taken from a moment in time and at 5′ height to maintain a broad application of the findings. As such, the number of cells coded to primary signage on average changes just slightly within the mid-twenties regardless of placemaking intensity. The images were not designed to be aesthetic placemaking opportunities but to feature an increasing quantity of visual excitement.

The number of cells counted for building façade, turf, sidewalk surface, and the sky continually declines as the images become more intense in their placemaking. The cells dedicated to road surface also decrease once at level 1 and then stay relatively steady (approximately 106 cells to approximately 88–95 cells in the levels featuring placemaking). This indicates a more complex streetscape filled with people, art, and tree canopies occupying space once featuring the building, sky, and sidewalk (see Figure 3).

Affordance Theory

Our streets can be diverse places: from the building typologies to the types of furniture and art we may (or may not) enjoy, and the people with whom we walk. As Jacobs (1961) and Whyte (1980) wrote, it is this diversity of opportunities that invites more people to join the streetscape. The opportunities (social, economic, and aesthetic) can directly influence behavior.

Affordance theory is an ecologically oriented theory, influenced by biological perspectives, and intends to characterize, analyze, and explain the behavior and function of a human in different settings (Gibson, 1978; Gibson & Shaw, 1977). The ecologically oriented perspective focuses on the functional relationship between the organism and the environment and examines the responses of organisms to their environments by changing the environment's stimuli. This approach aims to identify the mechanism of the relationship between human behavior and the environment to improve this relationship and make the environment more humane.

Gibson introduced the concept of "affordances" to define the actionable features between a person and their surroundings (Gibson, 1978; Gibson & Shaw, 1977). In Gibson's (1978) opinion, affordances are relationships between the environment and an actor (person or animal) that do not have to be prominent or even known to the actor. Gibson (1986, p. 127) defined accurately defined affordance as follows: "The affordances of the environment are what it offers the animal, what it provides or furnishes, either for good or ill." The main feature of affordance theory is that in Gibson's view, the role of "cognition" has been neglected, and he believed that there is an immediate relationship between stimuli or "affordance" and "action."

Affordance theory states that the world is perceived not only in terms of physical environment shapes and relationships but also in terms of environmental possibilities for action (affordances). This theory has been used to investigate and monitor the relationship between the functional aspects of the environment and how the subject tends to use the environment (Clark & Uzzell, 2002). People may feel the placemaking excitement, while still processing signage precognitively.

Streetscapes and Signage

Business owners' avoidance of placemaking in the streetscapes, particularly regarding street trees, may have validity. Many business owners think these trees will block their stores or encourage loitering. Across all 200 images, signage visibility in preattentive processing is at its best with plain buildings and exposed road surfaces. These surfaces lack an abundance of detail or color changes and thus serve as a visual affordance for the pedestrian to precognitively recognize the sign when interpreted with VAS. This is further emphasized when analyzing the 26 original photographs. None of the streetscape elements held significant influence on precognitive behaviors. However, these images lack most streetscape elements. The amount of building façade continued to trend towards supporting visibility. Though we may not perceive signage visibility decreasing, these more plain settings afford precognitive signage visibility.

The landscape, trees, and sky significantly impact the VAS output percentage because the software, using brain science, targets greens and blues in an image as areas of precognitive priority. Furthermore, the greater concentration of sky in an image indicates a strong edge, another VAS analysis priority, between the roof line and the start of the sky. The trees, especially in the foreground, offer an abundance of textures, or edges, in the leaves.

The sky continues to be a significant or trending detractor from preattentive signage visibility across intensity levels 1–3. Planners and designers may use this knowledge to carefully design the scale of the streetscape. For example, building heights and the width of sidewalks and streets will impact the amount of visible sky, particularly in the periphery of the cone of vision. While building height may be limited for safety or aesthetics, the sidewalk width must also be considered. Other means to limit the amount of visible sky include the use of street trees, which are not significant or trending detractors at levels 1–3. A canopy creates a visual "ceiling" in a streetscape and can help keep the eye on the first-floor businesses and on-premise signage.

The secondary signage, such as advertisements indicating special deals in the business, the menu near the door, or signs placed on the sidewalk, support signage visibility before cognition at level 3 intensities. This is likely the influence of the research team placing secondary signage often near the primary, on-premise signage. In streetscapes of intense complexity, on-premise signage visibility may be afforded with additional attractions placed near the doorway or in the first-floor windows as they increase the visual richness VAS analyzes.

The functional aspects of a setting define how the person can use the environment. Gibson's theory states that these functional features and the psychological or behavioral reaction to the environment should be analyzed

together. This theory extends a strategy of looking at the functional understandings of different elements of the built environments and how the environment "affords" a specific action—in this case, the action of going toward the designated spaces. Changing design features of the built environment and adding placemaking elements can cause enhanced behaviors and desired actions we expect from pedestrians and possible customers. Affordance can function as a conceptual framework to improve design processes to better understand the relationship between environment and the user.

Placemaking Opportunities

The development of placemaking principles in the streetscape allows humans to visit, shop or dine, and live in a well-planned and designed environment. This study demonstrates how placemaking can negatively impact on-premise signage preattentive processing. It is the placemaking, though, that when properly executed for a community, can bring more people to an environment and offset the one-time, decreased VAS Output. In the Great Lakes Region, between 60% and 90% of survey respondents are willing to walk up to 20 minutes to visit retail stores, grocery stores, entertainment venues, restaurants, schools, convenience stores, and, not surprisingly, parks and transit stops. Using such a human-oriented approach to planning and urban design brings in new residents and provides more economic opportunities (Graebert, 2013). Built environment professionals, residents, and business owners have a responsibility to ensure the entire streetscape is an inviting place to promote shared wellbeing.

Designers and planners should be careful to integrate their knowledge to space streetscape elements appropriately for signage pre and postattentive visibility. A team has the shared responsibility to ensure, for example, that a building's multiple ingress points (and presumably the on-premise sign) alternate with required street tree planting distances. Form-based code, too, can guide designers to limit the heights of buildings and sidewalk shade structures as well as their distance extending from the building. Landscape ordinances and landscape architects can choose the tree for the area to ensure appropriate branching patterns that balance shaded opportunities, keep the eye directed to the building's first floor, and keep on-premise signs visible.

The building surfaces are generally flat in color. The windows on upper stories may provide diversity in taller buildings, but the photos are from the pedestrian shopper's viewpoint and do not intentionally look upward to see the windows above. This knowledge may be utilized to guide unique placements of on-premise signage and thus encourage placemaking potential. Architects may add accented areas on the façade in consultation with urban planners and business owners to draw the eye. Here, sign designers can add unique typologies and colors to further draw the eye to a sign placed over an accented facade. Wayfinding designers may use more neutral color as a canvas to place their visually accented, directional information.

Placemaking can bring people to the streetscape for the businesses, and signage provides the information to guide the people. The two are linked as important teammates for economic development and distributing knowledge. As placemaking suggests interdisciplinary teams, sign manufacturers, designers, and installers can further engage with municipal planners, architects, and landscape architects to ensure the collective goals of placemaking are achieved and signs highlight each business and opportunity.

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